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10/729,349	12/05/2003	John Klocke	291958237US	8267

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EXAMINER	
WILKINS III, HARRY D	

ART UNIT	PAPER NUMBER
1742	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/729,349	KLOCKE ET AL.	
	Examiner	Art Unit	
	Harry D. Wilkins, III	1742	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 March 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-33* is/are pending in the application.

4a) Of the above claim(s) *2* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1 and 3-33* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *05 December 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Interpretation

1. Applicant has challenged the treatment of claims 8-10, 24-29, 32 and 33 by the Examiner, because the first and second fluid/electrolyte are positively recited by the claims, such that the fluids/electrolytes form an integral part of the apparatus for these claims. As such, these claims are treated as requiring the inclusion of the claimed first and second fluids/electrolytes.

2. Claims 30 and 31 contain limitations related to the volume of the electrolytes utilized within the structure of the invention. As per MPEP 2115:

> "Expressions relating the apparatus to contents thereof during an intended operation are of no significance in determining patentability of the apparatus claim." Ex parte Thibault, 164 USPQ 666, 667 (Bd. App. 1969). Furthermore, "[i]nclusion of material or article worked upon by a structure being claimed does not impart patentability to the claims." In re Young, 75 F.2d *>996<, 25 USPQ 69 (CCPA 1935) (as restated in In re Otto, 312 F.2d 937, 136 USPQ 458, 459 (CCPA 1963)).

As such, the limitation relating to the volume of the electrolytes utilized within the electroplating/electroetching cell have not been given any patentable weight since they fail to further limit the structure of the claimed apparatus.

3. Therefore, all rejections of claims 8-10, 24-29, 32 and 33 have been withdrawn.

Rejection Status

4. The rejection of claims 1 and 24 based on Woodruff et al has been withdrawn in view of Applicant's amendment narrowing the scope of the claims.

5. The rejection of independent claims 1, 19, 23, 24 and 27 based on Calhoun have been withdrawn in view of Applicant's amendment to those claims.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 19-22 are rejected under 35 U.S.C. 102(b) as being clearly anticipated by Woodruff et al (US 2001/0032788).

Woodruff et al teach (see figures 3-4, 7A-7D, 8 and 9A and paragraphs 57 and 81-89) an electroplating chamber including a processing chamber (e.g.-400) including a head assembly (160) including a workpiece holder configured to position a microfeature workpiece at a processing site and a plurality of electrical contacts arranged to provide electrical current to a layer on the workpiece and a vessel including a processing unit for carrying a catholyte proximate to the workpiece, an electrode unit (e.g.-600) having an upper portion canted relative to the processing unit and being configured to carry the anolyte proximate the electrodes, the electrode unit including a plurality of electrodes, and a barrier (710) between the processing unit and the electrode unit to separate the catholyte and anolyte.

Regarding the limitation of "the barrier being canted along the upper portion of the electrode unit", Woodruff et al teach (see paragraph 84) that the interface member (e.g.-710) including the cation exchange membrane could be arranged with a slight tilt to force bubbles out of the second processing fluid.

Regarding claim 20, Woodruff et al teach that the barrier unit included a cation-selective membrane (see paragraph 87).

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

9. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

10. Claims 1, 3-7, 11-18 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Woodruff et al (US 2001/0032788) in view of Carl et al (US 6,436,267) with evidence from Lu et al (US 2002/0195351) for claim 17 only.

Woodruff et al teach (see figures 4, 7A-7D, 8 and 9A and paragraphs 57 and 81-89) an electroplating chamber including a processing chamber (e.g.-400) including a

first flow system configured to convey a flow of a first processing fluid to a microfeature workpiece, an electrode unit (e.g.-600) coupled to the processing unit, the electrode unit including a plurality of electrodes and a second flow system configured to convey a flow of a second processing fluid at least proximate to the electrode and a non-porous barrier unit (e.g.-700) between the processing unit and the electrode unit to separate the first and second processing fluids, the non-porous barrier being a material that allowed cations to pass through the barrier between the first and second processing fluids.

Thus, Woodruff et al fail to teach detachably mounting the barrier unit below the processing unit and releasably coupling the electrode unit below the barrier unit, such that the electrode unit was spaced apart from the processing unit.

Carl et al teach (see col. 11 line 54, to col. 14, line 6) constructing electroplating cells in a modular fashion so that they can easily be disassembled for repair.

Therefore, it would have been obvious to one of ordinary skill in the art to have modified the electroplating cell of Woodruff et al to be modular, as suggested by Carl et al, to permit the cell to be easily disassembled for repair.

Since the barrier of Woodruff et al needed to remain between the electrode unit and the processing unit, it would have been obvious to one of ordinary skill in the art to have placed it at an intermediate position in the cell as claimed.

Regarding claims 3-5, the membrane (700) of Woodruff et al was a cation exchange membrane that separated the flow of the first and second processing fluids. Such a membrane would inherently have some flexibility.

Regarding claim 6, the membrane (700) of Woodruff et al permitted electrical current to pass through by action of the transfer of ions.

Regarding claim 7, the membrane divided the first and second fluid systems into anolyte and catholyte.

Regarding claims 11 and 12, Woodruff et al teach that the electrodes could be operated independently of each other to control the corresponding electric field.

Regarding claim 13, the cell of Woodruff et al included a field shaping module (e.g.-536) to shape an electrical field in the first processing fluid induced by the concentric electrodes.

Regarding claim 14, Woodruff et al teach (see paragraph 84) that the interface member (e.g.-710) including the cation exchange membrane could be arranged with a slight tilt to force bubbles out of the second processing fluid.

Regarding claim 15, the cell of Woodruff et al included a "barrier unit" (interface member (e.g.-710)) coupled to the processing and electrode units, wherein the barrier unit included the non-porous barrier.

Regarding claim 16, the membrane of Woodruff et al included first and second sides, with the first flow system on one side, and the second flow system on the other side.

Regarding claim 17, it would have been within the ability of one of ordinary skill in the art to have selected pure copper as the material for the anodes instead of phosphorous-doped copper because pure copper anodes were well known within the

art of copper electroplating on electronic workpieces to be suitable alternatives to phosphorous-doped copper. See Lu et al (US 2002/0195351) in paragraph 25.

Regarding claim 18, Woodruff et al teach (see paragraph 86) using phosphorous-doped copper anodes.

Regarding claim 23, the cell of Woodruff et al included a "barrier unit" (interface member (e.g.-710)) coupled to the processing and electrode units, wherein the barrier unit included the non-porous barrier. The interface member included at least some portion both the catholyte and anolyte within its confines, separated by the cation exchange membrane. See, e.g.-figures 9A and 9B of Woodruff et al where there is some amount of space within the openings (732 and 742) which would be "in" the barrier unit. Further, replacement of the nuts/bolts of Carl et al as the quick release mechanism, with other quick release mechanisms is considered within the ability of one of ordinary skill in the art, such as replacement with a latch to hold the barrier unit and electrode unit together.

11. Claims 8-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Woodruff et al (US 2001/0032788) in view of Carl et al (US 6,436,267) as applied above to claim 1, and further in view of Mayer et al (US 6,527,920).

The teachings of Woodruff et al and Carl et al are described above.

Woodruff et al do not teach the composition utilized for the anolyte and catholyte (first and second fluid/electrolyte).

Mayer et al teach (see abstract, figure 2, and cols. 19-20) another divided electroplating cell wherein the catholyte contained 0-250 g/L of acid, preferably 10-180

g/L acid and 10-50 g/L of copper and the anolyte was a composition generally similar to that of the catholyte but without the non-ionic plating additives, and was generally preferred to have "a substantially lower acid concentration than the catholyte".

Therefore, since Woodruff et al was silent with respect to the compositions utilized in the claimed structure, and Mayer et al teach compositions to be used in an electroplating cell being divided into catholyte and anolyte that have certain advantages, including reduced anode mediated degradation of electrolyte additives (see col. 3, lines 23-35 of Mayer et al), one of ordinary skill in the art would have been led to use the compositions disclosed by Mayer et al in the apparatus of Woodruff et al because of the similar electroplating cell structures disclosed by each, and Mayer et al discloses certain advantages to using the disclosed compositions.

12. Claims 30-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Woodruff et al (US 2001/0032788).

Woodruff et al teach (see figures 4, 7A-7D, 8 and 9A and paragraphs 57 and 81-89) a system for wet chemical processing of microfeature workpieces including a processing unit for providing a first electrolyte to a microfeature workpiece, an electrode unit for carrying a second electrolyte and an electrode proximate to the second electrolyte and a semipermeable barrier between the processing unit and the electrode unit to separate the second electrolyte and the first electrolyte while permitting cations to pass between the second and first electrolytes.

Thus, Woodruff et al fail to expressly teach including reservoirs for storing the first and second electrolytes, as claimed.

However, Woodruff et al do teach (see paragraph 88) that the catholyte (first electrolyte) and the anolyte (second electrolyte) were maintained as separate compositions and the distributor (300) was capable of feeding different compositions to each of the processing unit and the electrode unit.

Therefore, it would have been obvious to one of ordinary skill in the art to have added a first reservoir in fluid communication with the processing unit and a second reservoir in fluid communication with the electrode unit for the purpose of providing a continuous flow of electrolyte through the electroplating cell.

With respect to the limitation that the total volume of the first electrolyte was at least twice the total volume of the second electrolyte, changes in size have been held to be prima facie obvious absent a showing of unexpected results. See MPEP 2144.04.IV.A. Further, the claimed is defined that the first reservoir and the processing unit are "configured to carry a first volume of the first electrolyte" and the second reservoir and the electrode unit are "configured to carry a second volume of the second electrolyte". Two tanks of the same size are "configured" to carry different volumes since that limitation is related to the manner in which the structures are used. See MPEP 2114.

13. Claims 32-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Woodruff et al (US 2001/0032788) as applied above to claims 33-34, and further in view of Mayer et al (US 6,527,920).

The teachings of Woodruff et al are described above.

Woodruff et al do not teach the composition utilized for the anolyte and catholyte (first and second fluid/electrolyte).

Mayer et al teach (see abstract, figure 2, and cols. 19-20) another divided electroplating cell wherein the catholyte contained 0-250 g/L of acid, preferably 10-180 g/L acid and 10-50 g/L of copper and the anolyte was a composition generally similar to that of the catholyte but without the non-ionic plating additives, and was generally preferred to have "a substantially lower acid concentration than the catholyte".

Therefore, since Woodruff et al was silent with respect to the compositions utilized in the claimed structure, and Mayer et al teach compositions to be used in an electroplating cell being divided into catholyte and anolyte that have certain advantages, including reduced anode mediated degradation of electrolyte additives (see col. 3, lines 23-35 of Mayer et al), one of ordinary skill in the art would have been led to use the compositions disclosed by Mayer et al in the apparatus of Woodruff et al because of the similar electroplating cell structures disclosed by each, and Mayer et al discloses certain advantages to using the disclosed compositions.

14. Claims 24-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Woodruff et al (US 2001/0032788) in view of Mayer et al (US 6,527,920).

With respect to claim 24, Woodruff et al teach (see figures 4, 7A-7D, 8 and 9A and paragraphs 57 and 81-89) an electroplating system including a processing unit (e.g.-400) including a first flow system configured to convey a flow of a first processing fluid to a microfeature workpiece, an electrode unit (e.g.-600) coupled to the processing unit, the electrode unit including a plurality of electrodes and a second flow system

configured to convey a flow of a second processing fluid at least proximate to the electrode and a non-porous barrier (e.g.-700) between the processing unit and the electrode unit to separate the first and second processing fluids, the non-porous barrier being a material that allowed cations to pass through the barrier between the first and second processing fluids.

With respect to claim 27, Woodruff et al teach (see figures 4, 7A-7D, 8 and 9A and paragraphs 57 and 81-89) an electroplating chamber including a processing chamber (e.g.-400) including a first flow system configured to convey a flow of a first processing fluid to a microfeature workpiece, an electrode unit (e.g.-600) coupled to the processing unit, the electrode unit including a plurality of electrodes and a second flow system configured to convey a flow of a second processing fluid at least proximate to the electrode and a non-porous barrier (e.g.-700) between the processing unit and the electrode unit to separate the first and second processing fluids, the non-porous barrier being a material that allowed cations to pass through the barrier between the first and second processing fluids.

Thus, Woodruff et al fail to teach the composition utilized for the anolyte and catholyte (first and second fluid/electrolyte).

Mayer et al teach (see abstract, figure 2, and cols. 19-20) another divided electroplating cell wherein the catholyte contained 0-250 g/L of acid, preferably 10-180 g/L acid and 10-50 g/L of copper and the anolyte was a composition generally similar to that of the catholyte but without the non-ionic plating additives, and was generally preferred to have "a substantially lower acid concentration than the catholyte".

Therefore, since Woodruff et al was silent with respect to the compositions utilized in the claimed structure, and Mayer et al teach compositions to be used in an electroplating cell being divided into catholyte and anolyte that have certain advantages, including reduced anode mediated degradation of electrolyte additives (see col. 3, lines 23-35 of Mayer et al), one of ordinary skill in the art would have been led to use the compositions disclosed by Mayer et al in the apparatus of Woodruff et al because of the similar electroplating cell structures disclosed by each, and Mayer et al discloses certain advantages to using the disclosed compositions.

15. Claims 30-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Calhoun et al (US 5,883,762) in view of Inagaki (JP 59-150094).

Calhoun et al teach (see figures 2 and 3 and cols. 5-12) a system for wet chemical processing of microfeature workpieces including a processing unit for providing a catholyte to a microfeature workpiece, an electrode unit for carrying an anolyte and an electrode proximate to the anolyte and a semipermeable barrier (cation exchange membrane) between the processing unit and the electrode unit to separate the anolyte and the catholyte while permitting cations to pass between the two.

Calhoun et al teach using a single anode electrode and not a plurality of anodes.

Inagaki teaches (see pages 16-17 of English translation) utilizing multiple anodes, operable at different current densities, to control the thickness of electroplated material on the cathode, particularly to achieve more uniform electroplated thickness.

Therefore, it would have been obvious to one of ordinary skill in the art to have formed the anode electrode of Calhoun et al into several anode segments as suggested

by Inagaki because the anode segments would have permitted more precise control of the electroplated metal layer thickness.

Thus, Calhoun et al fail to expressly teach including reservoirs for storing the catholyte and anolyte, as claimed.

However, Calhoun et al do teach (see cols. 8-9) that the catholyte (first electrolyte) and the anolyte (second electrolyte) were maintained as separate compositions.

Therefore, it would have been obvious to one of ordinary skill in the art to have added a first reservoir in fluid communication with the processing unit and a second reservoir in fluid communication with the electrode unit for the purpose of providing a continuous flow of electrolyte through the electroplating cell.

With respect to the limitation that the total volume of the first electrolyte was at least twice the total volume of the second electrolyte, changes in size have been held to be prima facie obvious absent a showing of unexpected results. See MPEP 2144.04.IV.A. Further, the claimed is defined that the first reservoir and the processing unit are "configured to carry a first volume of the first electrolyte" and the second reservoir and the electrode unit are "configured to carry a second volume of the second electrolyte". Two tanks of the same size are "configured" to carry different volumes since that limitation is related to the manner in which the structures are used. See MPEP 2114.

16. Claims 32-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Calhoun et al (US 5,883,762) in view of Inagaki (JP 59-150094) as applied above to claims 33-34, and further in view of Mayer et al (US 6,527,920).

The teachings of Calhoun et al and Inagaki are described above.

Woodruff et al do not teach the composition utilized for the anolyte and catholyte (first and second fluid/electrolyte).

Mayer et al teach (see abstract, figure 2, and cols. 19-20) another divided electroplating cell wherein the catholyte contained 0-250 g/L of acid, preferably 10-180 g/L acid and 10-50 g/L of copper and the anolyte was a composition generally similar to that of the catholyte but without the non-ionic plating additives, and was generally preferred to have "a substantially lower acid concentration than the catholyte".

Therefore, since Woodruff et al was silent with respect to the compositions utilized in the claimed structure, and Mayer et al teach compositions to be used in an electroplating cell being divided into catholyte and anolyte that have certain advantages, including reduced anode mediated degradation of electrolyte additives (see col. 3, lines 23-35 of Mayer et al), one of ordinary skill in the art would have been led to use the compositions disclosed by Mayer et al in the apparatus of Woodruff et al because of the similar electroplating cell structures disclosed by each, and Mayer et al discloses certain advantages to using the disclosed compositions.

Response to Arguments

17. Applicant's arguments with respect to at least claims 1 and 3-29 have been considered but are moot in view of the new ground(s) of rejection.

18. Applicant's arguments filed 30 March 2007 with respect to claims 30-31 have been fully considered but they are not persuasive. A reservoir "configured to carry a first volume" can be any size larger than the first volume. Thus, Applicant's argument that the prior art does not teach reservoirs have the claimed volumes is not found persuasive because the invention defined by claim 30 can have two reservoirs of equal size, with one reservoir just being filled a only half capacity.

Double Patenting

19. The terminal disclaimers filed on 30 March 2007 disclaiming the terminal portion of any patent granted on this application which would extend beyond the expiration date of any patents granted on Application Numbers 09/872,151 and 10/729,357 have been reviewed and are accepted. The terminal disclaimers have been recorded.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Harry D. Wilkins, III whose telephone number is 571-272-1251. The examiner can normally be reached on M-F 8:30am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy V. King can be reached on 571-272-1244. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Harry D Wilkins, III
Primary Examiner
Art Unit 1742

hdw